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For Consideration by the Indirect Effects Expert Panel

Please answer the following question, supporting your opinion as extensively as possible.

For each stock, is the estimated number of dolphins affected by the tuna fishery, considering data on sets per year, mortality attributable to the fishery, indicators of stress in blood, skin and other tissues, cow-calf separation, and other relevant indirect effects information, at a magnitude and degree that would risk recovery or appreciably delay recovery to it OSP level (how and to what degree)?

Yes, the number of dolphins affected by tuna purse-seine fishing in each of the three depleted stocks is significant enough to risk or appreciably delay recovery to OSP levels considering the number of sets per year, the variety of ways in which dolphin mortalities occur in addition to the bycatch, and the indirect effects upon dolphins from chase and encirclement. Although reported dolphin mortalities (bycatch) are currently limited to those dolphins found dead within an enclosed net, additional types of unobserved dolphin mortalities and indirect effects occur including female-calf separation resulting in calf loss, delayed capture-related mortalities, cumulative organ damage in released animals, failed reproduction, and predation of released dolphins.

Magnitude

Currently, dolphin bycatch alone does not account for the absence of population growth based on the population models by Wade (2002) for each of the three depleted stocks. However, if only 2.4 unobserved mortalities per set were detected for northeastern offshore spotted dolphins, for example, this would result in 11,000 additional mortalities per year (SWFSC 2002). This would also fit the Wade model for understanding why recovery of the depleted stock is not occurring. It is certain that the unobserved and previously unacknowledged impacts identified in this determination are occurring and the sum of these impacts could easily account for: a) 2.4 additional northeastern offshore spotted dolphin mortalities per set, b) 3.4 eastern spinner dolphin mortalities per set, and c) 1.1 coastal spotted dolphins mortalities per 100 chased (SWFSC 2002). Some of the impacts, such as calf loss from female-calf separation, may be occurring to a degree large enough by themselves to risk recovery, however the additive effects of all of these impacts clearly are of significant magnitude considering that only a small number mortalities per set or chase are necessary.

Female-calf separations

It is apparent that some calves do indeed become separated from their mothers due to chase and encirclement resulting in unobserved calf mortalities. Dolphin calves are dependent on their mother for about two years. If suckling calves (one year of age or less) are separated, they are at very considerable risk of starvation. Weaned calves are also at considerable risk because separated calves continuously send out acoustic signals attracting the attention of predators (Edwards 2002).

Many factors contribute to the likelihood that calves will separate from their mothers during chase and encirclement. There is a significant difference in the attainable speed and stamina

between cows and calves, especially with smaller calves, faster speeds, and longer chases (Edwards 2002); and in response to threat, dolphin mothers typically focus on staying with other adults rather than staying with their calves (Edwards 2002). It is especially difficult for calves to keep up with their mothers when the chase quickens and the adults are repeatedly clearing the water as they swim. Also after being released, adult dolphins swim very rapidly for an extended period of time (Chivers and Scott 2002) and tend to mix into new dolphin groups rather than reforming with the original group (Chivers and Scott 2002).

Younger calves are especially susceptible to separation. The chance of young calves being separated is noticeably high when one considers that because 5,000 nets are set each year for northeastern offshore spotted dolphins, for example, calves are exposed to chase on an average of once a month. This not only results in repeated risks of separation, it also increases the chance that calves are first exposed to chase at a very young age when they are most susceptible. As a result of these factors, this unobserved mortality could be very significant.

The data also supports the presence of cow-calf separation. Archer et al. (2001) reported that 80% of killed lactating females in the bycatch were without calves. If lactating cows and calves are both found dead in the net, it is generally assumed they are related. However, genetic investigation demonstrated that of 5 calves from three sets, only one calf genetically matched any of the lactating females (Archer et al. 2001). And in the most recent abundance survey, a lower proportion of calves was observed (Cramer and Perryman 2002).

Acute Or Agonal Stress And Cumulative Impacts

Capture is likely one of the most traumatic event in an animal's life. For some ETP dolphins, the severity of fear, shock, and physical exertion from chase and capture results in death from acute cardiac injury (often referred to as a heart attack) and kidney damage is demonstrated as well (Cowan and Curry 2002). The organ damage described by Cowan and Curry (2002) is something which occurs over time (during chase and encirclement) and which will be present to varying degrees in a portion of the animals which do not die. This is confirmed by the evidence of heart and kidney scars observed in necropsied dolphins (Cowan and Curry 2002).

In other words, a portion of the dolphins released from nets have acute heart and kidney damage in addition to other stress abnormalities. The damage resulting from capture-related stress is often referred to as capture myopathy (St. Aubin 2002b). Although some professionals may associate capture myopathy with stress-related damage to skeletal muscle, it is actually a complex psychological and physiological ailment. If severe enough, terrestrial animals can die hours or days later (Chalmers and Barret 1977, Lewis et al. 1977, Montane et al. 2002, Wobeser et al. 1976). For dolphins, Aubin (2002), Aubin (2002a), and Cowan and Curry (2002) have clearly demonstrated that these cetaceans participate in the same psychological, physiological, and pathological mechanisms capable to producing delayed mortalities.

With milder cases, scarring will occur in damaged organs (heart and kidneys) which can be compounded with each capture. This permanent organ damage can make an animal more susceptible to subsequent captures, less successful in reproduction, and possess a shorter life span. The compromises of these scarring events are compounded considering that the average

northeastern offshore spotted dolphin, for example, will be chased 10.6 times per year and captured 3.5 times per year (Archer et al. 2002).

Length of Chase Time

The length of time that dolphins are impacted by the capture event is drastically underestimated. Cowan and Curry (2002) associated acute changes leading to death with the period of encirclement, yet the “fight or flight reflex”, and its associated psychological and physiological changes, begins with the chase. Even if the period of chase is considered, official chase time is traditionally considered to begin when speedboats enter the water to begin herding dolphins and tuna into nets (Archer et al. 2002). In truth, the negative stress-related impacts begin as soon as dolphins detect seiners or their helicopters and, therefore chase time realistically begins when helicopters, if used, are above the dolphins (Chivers and Scott 2002) or when dolphins first encounter a fishing vessel.

In addition, strenuous exertion does not end upon release from the net. In fact, it has been demonstrated that the highest sustained (exerted) speeds are post-release with swimming speeds of 5.2-6.2 kn (faster than chase speeds) lasting as much or more than 1 ½ hours after release from the net (Chivers and Scott 2002).

This broader understanding of the chase period demonstrates that dolphins experience more fear, anxiety and physical exertion than previously acknowledged. The longer chase period reaffirms the conclusion that calves do become separated. And longer periods of fear and exertion are more likely to produce varying degrees of damage to heart and kidneys in released dolphins.

Failed Reproduction

It is generally understood among the wildlife and veterinary professions that capture of pregnant animals should be avoided because the fear, stress, and physiological impacts of capture can result in failed pregnancies. The organ damage described above that is likely present in released animals can be capable of challenging a pregnancy. In addition, the stress and fear of chase and capture stimulates release of excitatory hormones in dolphins (St.Aubin 2002) and in late gestation, these excitatory hormones can induce premature labor resulting in fetal death. Although it is extremely difficult to document the extent of this indirect effect, it is extremely likely that a portion of pregnant dolphins chased and captured will experience failed pregnancy.

Facilitated Predation

Released dolphins, similar to other wild animals, are more susceptible to predation when traumatized and disoriented from chase and capture. Predators, such as sharks, have been observed just beyond the perimeter of the net utilizing the advantage given to them. Although this may not be a significant event, it contributes to the cumulative indirect impacts and identifies another source of previously unacknowledged mortalities.

Unmonitored and Unreported Observed Mortalities

Observer coverage is reported as 100% for ships capable of setting on dolphins (Archer et al. 2002). However, this observer coverage is limited to Class 6 vessels and therefore fleets with smaller class vessels are unobserved. It is widely known that many of these vessels fish on dolphins and contribute to dolphin mortalities. If we are going to truly analyze the impacts of the

tuna fishery, we must also be open to these unreported kills as well as their indirect effects (mortalities) described in this determination.

Summary

In conclusion, more dolphins are killed than reported. In many cases, these mortalities are occurring from unobserved causes such as calf losses from separation from mother, delayed capture-related mortalities, failed pregnancy, and predation. In addition, released dolphins likely experience various degrees of heart and kidney tissue damage that is potentially cumulative from repeated chase and capture events. Collectively, it is extremely likely that these unreported mortalities and indirect effects are of a magnitude and degree (2-3 animals per set) to risk recovery of the three depleted dolphin stocks.

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